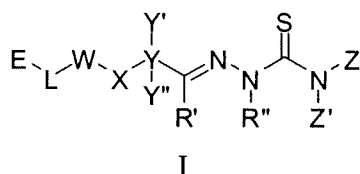


**Amendments to the Claims:**

1. (Canceled)
2. (Currently amended): A composition ~~according to claim 1~~, comprising:  
a vaccine in an amount effective to stimulate a cell-mediated immune response; and  
a vaccine adjuvant comprising a thiosemicarbazone or a derivative thereof, in an amount  
effective to potentiate the cell-mediated immune response to the vaccine,

wherein the thiosemicarbazone is a compound of formula I:



wherein:

E is absent or selected from the group consisting of alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, aryl, substituted aryl, heterocyclyl, substituted heterocyclyl, heteroaryl, and substituted heteroaryl;

L is absent or is selected from the group consisting of oxo, amino, alkylene, substituted alkylene, alkoxy, alkylamino, aminoalkyl, heterocyclyl, carbocyclyl, and carbonyl;

W is absent or selected from the group consisting of cycloalkyl, substituted cycloalkyl, aryl, substituted aryl, heterocyclyl, substituted heterocyclyl, heteroaryl, and substituted heteroaryl;

X is absent or is selected from the group consisting of oxo, amino, alkylene, substituted alkylene, alkoxy, alkylamino, aminoalkyl, heterocyclyl, carbocyclyl, and carbonyl;

Y is selected from the group consisting of cycloalkyl, substituted cycloalkyl, aryl, substituted aryl, heterocyclyl, substituted heterocyclyl, heteroaryl, and substituted heteroaryl;

Y' is absent or is selected from the group consisting of F, Cl, Br, I, nitro, alkyl, substituted alkyl, heterocyclyl, substituted heterocyclyl, amino, alkylamino, and dialkylamino;

Y'' is absent or is selected from the group consisting of F, Cl, Br, I, nitro, alkyl, substituted alkyl, heterocyclyl, substituted heterocyclyl, amino, alkylamino, and dialkylamino;

R' is H, alkyl, or substituted alkyl;

R'' is H, or

R' and R'' are taken together to form a heterocyclic ring;

Z and Z' are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, substituted aryl, arylalkyl, substituted arylalkyl, heteroaryl, substituted heteroaryl, heteroarylalkyl, substituted heteroarylalkyl, alkoxy, substituted alkoxy, aminocarbonyl, alkoxycarbonyl, carboxyl sulfonyl, methanesulfonyl, and substituted or unsubstituted alkylcarbonyl, arylcarbonyl, aralkylcarbonyl, heteroarylcarbonyl, heteroaralkylcarbonyl, alkylcarbonyloxy, arylcarbonyloxy, aralkylcarbonyloxy, heteroarylcarbonyloxy, heteroaralkylcarbonyloxy, alkylaminocarbonyloxy, arylaminocarbonyloxy, formyl, loweralkylcarbonyl, loweralkoxycarbonyl, aminocarbonyl, aminoaryl, alkylsulfonyl, sulfonamido, aminoalkoxy, alkylamino, heteroarylamino, alkylcarbonylamino, alkylaminocarbonylamino, arylaminocarbonylamino, aralkylcarbonylamino, heteroarylcarbonylamino, arylcarbonylamino, cycloamidino, cycloalkyl, cycloimido, arylsulfonyl and arylsulfonamido; or

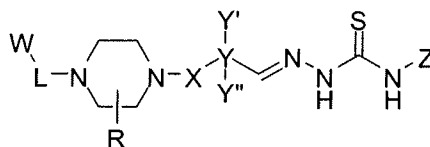
Z and Z' are taken together to form a heterocyclic group, which may be optionally substituted;

the tautomers and the pharmaceutically acceptable salts, esters, or prodrugs thereof.

3. (Original) The composition of claim 2 wherein R' is H.

4-74. (Canceled)

75. (New) The composition of claim 2 wherein the thiosemicarbazone is a compound of formula III,



III

wherein:

W is selected from the group consisting of substituted or unsubstituted alkyl, substituted or unsubstituted cycloalkyl, substituted or unsubstituted aryl, substituted or unsubstituted heterocyclyl, and substituted or unsubstituted heteroaryl groups;

X and L are each independently absent or independently selected from the group consisting of lower alkyl and carbonyl;

R is absent or selected from the group consisting of carbonyl, amino, alkyl, substituted alkyl, alkylamino, and dialkylamino;

Y is an aryl or heteroaryl group;

Y' is absent or selected from the group consisting of F, Cl, Br, I, alkyl, substituted alkyl, heterocyclyl, amino, alkylamino, dialkylamino, and nitro;

Y'' is absent or selected from the group consisting of F, Cl, Br, I, alkyl, substituted alkyl, heterocyclyl, amino, alkylamino, dialkylamino, and nitro;

Z is hydrogen, or if Y is furanyl, then Z may be selected from the group consisting of alkyl, substituted alkyl, heterocyclyl, amino, alkylamino, dialkylamino, and nitro; and salts, prodrugs, or tautomers thereof.

76. (New) The composition of claim 75 wherein W is an optionally substituted phenyl.

77. (New) The composition of claim 75 wherein W is substituted with at least one member selected from the group consisting of Br, Cl, F, and CF<sub>3</sub>.

78. (New) The composition of claim 75 wherein Y is selected from the group consisting of phenyl, furanyl, pyrridinyl, pyrrolyl, pyrazolyl, pyrazinyl, thiazolyl, imidazolyl and pyrimidinyl.

79. (New) The composition of claim 78 wherein Y is phenyl, furanyl, or pyrimidinyl.

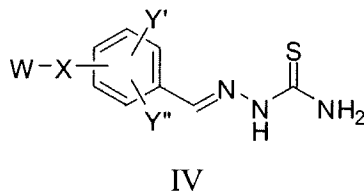
80. (New) The composition of claim 75 wherein Z is hydrogen.

81. (New) The composition of claim 75 wherein Y' is F or nitro.

82. (New) The composition of claim 75 wherein W is phenyl optionally substituted with -CF<sub>3</sub> or Cl; Y is phenyl; Y' is F or nitro; and Z is H.

83. (New) The composition of claim 2 wherein the thiosemicarbazone is a compound of

formula IV,



wherein:

W is an optionally substituted phenyl or pyridinyl group;

X is alkoxy or alkylamino;

Y' is H or fluoro;

Y'' is dialkylamino, fluoro, or nitro; and

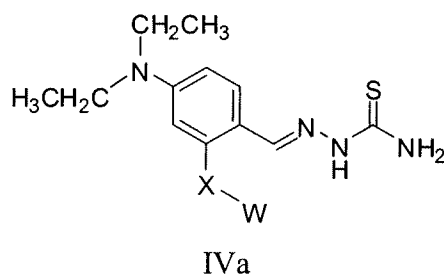
salts, prodrugs, or tautomers thereof.

84. (New) The composition of claim 83 wherein W is an optionally substituted phenyl.

85. (New) The composition of claim 83 wherein W is an optionally substituted pyridinyl group.

86. (New) The composition of claim 83 wherein W is substituted with at least one member selected from the group consisting of -Cl; -F; -Br; -CF<sub>3</sub>; -OCH<sub>3</sub>; -NO<sub>2</sub>; -CH<sub>3</sub>; -N(CH<sub>3</sub>)<sub>2</sub>; and -OCF<sub>3</sub>.

87. (New) The composition of claim 83 wherein the thiosemicarbazone is



wherein:

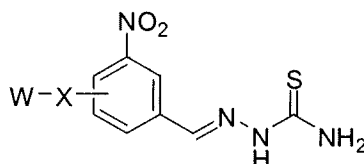
W is phenyl substituted with at least one member selected from the group consisting of -Cl; -F; -Br; -CF<sub>3</sub>; -OCH<sub>3</sub>; -NO<sub>2</sub>; -CH<sub>3</sub>; -N(CH<sub>3</sub>)<sub>2</sub>; and -OCF<sub>3</sub>;

X is alkoxy; and

salts, prodrugs, or tautomers thereof.

88. (New) The composition of claim 87 wherein X is  $-\text{OCH}_2-$ .

89. (New) The composition of claim 87 wherein the compound is



IVb

wherein:

W is pyridinyl or is phenyl substituted with at least one member selected from the group consisting of Cl, F, and  $\text{CF}_3$ ;

X is alkylamino; and

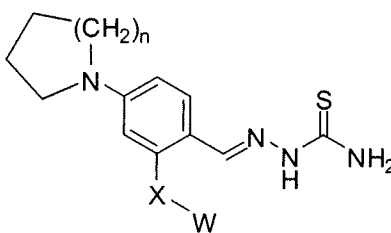
salts, prodrugs, or tautomers thereof.

90. (New) The composition of claim 89 wherein X is  $-\text{NHCH}_2\text{CH}_2-$  or  $-\text{NHCH}_2-$ .

91. (New) The composition of claim 89 wherein W is pyridinyl.

92. (New) The composition of claim 89 wherein W is phenyl substituted with Cl, F, and  $\text{CF}_3$ .

93. (New) The composition of claim 2 wherein the thiosemicarbazone is a compound of Formula IVc



IVc

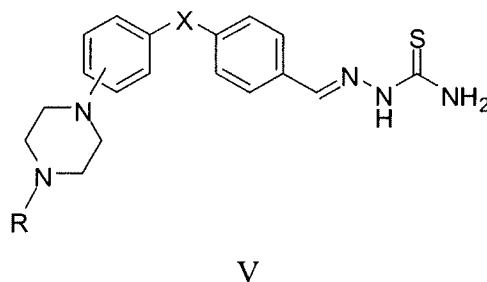
wherein:

W is phenyl substituted with at least one member selected from the group consisting of  $-\text{Cl}$ ;  $-\text{F}$ ;  $-\text{Br}$ ;  $-\text{CF}_3$ ;  $-\text{OCH}_3$ ;  $-\text{NO}_2$ ;  $-\text{CH}_3$ ;  $\text{N}(\text{CH}_3)_2$ ; and  $-\text{OCF}_3$ ;

X is alkoxy; and

n is an integer from 1 to 3.

94. (New) The composition of claim 2 wherein the thiosemicarbazone is a compound of Formula V



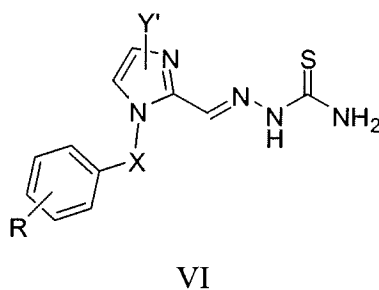
wherein:

R is an alkyl group;  
X is alkoxy; and  
salts, prodrugs, or tautomers thereof.

95. (New) The composition of claim 94 wherein R is methyl.

96. (New) The composition of claim 94 wherein X is -OCH<sub>2</sub>-; -OCH<sub>2</sub>CH<sub>2</sub>-; -CH<sub>2</sub>O-; or -CH<sub>2</sub>CH<sub>2</sub>O-.

97. (New) The composition of claim 2 wherein the thiosemicarbazone is a compound of Formula VI



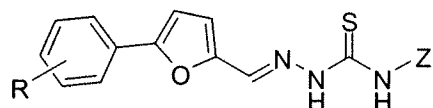
wherein:

X is absent or an alkylene;  
Y' is absent or is an alkyl group; and  
R is a halogen; and

salts, prodrugs, or tautomers thereof.

98. (New) The composition of claim 97 wherein X is  $-\text{CH}_2\text{CH}_2-$ ; Y' is absent or is methyl, and R is Cl.

99. (New) The composition of claim 2 wherein the thiosemicarbazone is a compound of Formula VII



VII

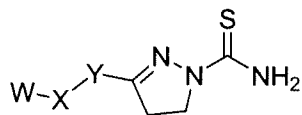
wherein:

R is nitro and Z is H; or

R is Cl and Z is selected from the group consisting of alkyl, pyridylalkylene, piperidinylalkylene, morpholinylalkylene, and piperizinyllalkylene; and salts, prodrugs, or tautomers thereof.

100. (New) The composition of claim 99 wherein Z is methyl, pyridylmethylene, piperidinylethylene, morpholinylethylene, piperizinylmethylene, piperiziny lethylene, and morpholinylbutylene.

101. (New) The composition of claim 2 wherein the thiosemicarbazone is a compound of formula VIII and salts, prodrugs, or tautomers thereof:



VIII

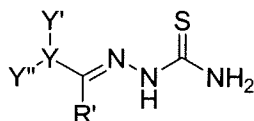
wherein:

W is a phenyl, substituted phenyl, pyridinyl, or substituted pyridinyl group;

X is absent or is selected from the group consisting of oxo, amino, alkylene, and substituted alkylene; and

Y is an aryl or heteroaryl group.

102. (New) The composition of claim 101 wherein Y is selected from the group consisting of phenyl, furanyl, pyridinyl, pyrrolyl, pyrazolyl, pyrazinyl, thiazolyl, and imidazolyl.
103. (New) The composition of claim 101 wherein Y is furanyl.
104. (New) The composition of claim 101 wherein X is absent.
105. (New) The composition of claim 101 wherein W is substituted with at least one member selected from the group consisting of -Cl; -F; -Br; -CF<sub>3</sub>; -OCH<sub>3</sub>; -NO<sub>2</sub>; -CH<sub>3</sub>; -N(CH<sub>3</sub>)<sub>2</sub>; and -OCF<sub>3</sub>.
106. (New) The composition of claim 2 wherein the thiosemicarbazone is a compound of formula IX:



IX

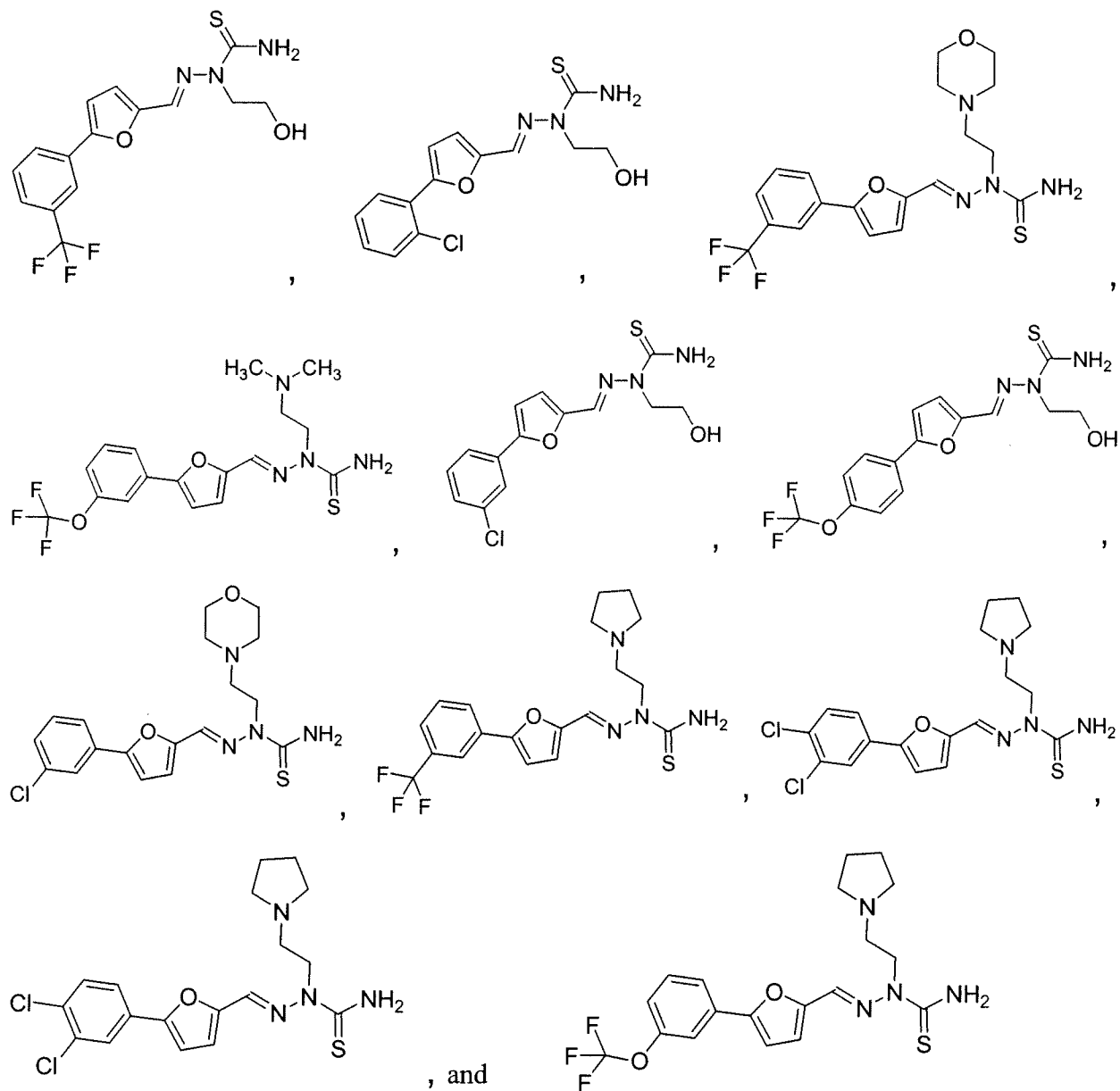
wherein:

- R' is H or lower alkyl;
  - Y is an aryl or heteroaryl group having one ring or two fused rings;
  - Y' is selected from the group consisting of halo, nitro, alkyl, substituted alkyl, alkenyl, substituted alkenyl, alkynyl, substituted alkynyl, heterocyclyl, substituted heterocyclyl, amino, alkylamino, and dialkylamino; and
  - Y'' is absent or is selected from the group consisting of halo, nitro, alkyl, substituted alkyl, heterocyclyl, substituted heterocyclyl, amino, alkylamino, and dialkylamino.
107. (New) The composition of claim 106 wherein Y is selected from the group consisting of phenyl, furanyl, pyrrolyl, pyrazolyl, pyrazinyl, thiazolyl, and imidazolyl.
108. (New) A composition comprising:
- a vaccine in an amount effective to stimulate a cell-mediated immune response; and
  - a vaccine adjuvant comprising a thiosemicarbazone or a derivative thereof, in an amount



effective to potentiate the cell-mediated immune response to the vaccine,  
wherein the thiosemicarbazone is independently selected from Tables I, II, and III.

109. (New) The composition of claim 108 wherein the thiosemicarbazone is selected from the group consisting of:



110. (New) The composition of claim 108 wherein the thiosemicarbazone is pyridine-2-carbaldehyde thiosemicarbazone or a pharmaceutically acceptable salt thereof.

111. (Withdrawn-New) A method of administering a vaccine comprising simultaneously administering

a vaccine in an amount effective to stimulate a cell-mediated immune response; and

a vaccine adjuvant comprising a thiosemicarbazone or derivative thereof of claim 2 or 108, in an amount effective to potentiate the cell-mediated immune response to the vaccine.

112. (Withdrawn-New) A method of administering a vaccine comprising separately administering

a vaccine in an amount effective to stimulate a cell-mediated immune response; and

a vaccine adjuvant comprising a thiosemicarbazone or derivative thereof of claim 2 or 108, in an amount effective to potentiate the cell-mediated immune response to the vaccine

wherein said vaccine adjuvant is administered either prior to or subsequent to administration of the vaccine.